

former Hindoos; it appears in the gigantic *Morais* on the island of the South Sea, as well as in the *Teocallis* and monuments of Mexico and North America.

Thus, wherever in the primitive time the conception of man breaks at first from the ordinary appearance of things to represent a higher idea, the pyramid is the form of such a monument. It belongs to no determined age, but it indicates the first beginning of art among all nations. It is the rough but vigorous expression of a new-awakened internal life, the true image of a mind which has become capable of a higher strain. It roots with its broad base in the earth, as the natural man, how much soever he elevates his mind, is not able to break from the earthly world, to which he is bound by a thousand chains; it terminates after the immense start it takes soon in a petty point, not nearer heaven after all than before, as paganism, even in its highest ideas, does not attain the really divine. Their interior is, like the heart of the heathen, narrow and dark, and almost totally filled with earthly matter. But one idea is expressed in these venerable monuments of the infant ages which elevated them to the rank of art in their time, and secures them this honour in all times,—the idea of the aspiration to a higher world.

As the ancient inhabitants of the plain countries approached the sublime nature of the neighbouring mountains with their industry, they were overwhelmed, as it were, by the sense of their impotency, and, therefore, gave up the attempt to form the exterior, but only to devote the more energy to interior form. The bare hollow in the interior of the pyramid, till then unheeded, now gained such an importance that, stripped of its covering shell (of the pyramidal form), it became the subject of a new strain, and gave rise to a new style of architecture. It grew to the organized structure of the rock-temple, while the exterior of the pyramid was replaced by picturesque rocks.

As architecture in the pyramid style grounded her form on the earthly substance, so now she begins a struggle against it. If the building rooted there with its large base, as if it was yet a part of it, so it now operates with a repulsive power. Though quite inclosed by the earthy substance, she now produces a separation in it, pushing back the walls and raising the upper side, the weight of the mass (we may compare it to the labours and sorrows of earth) rests no more on earthy ground, but is resisted by pillars which energetically rise, breaking from the connected mass of the bottom, a beautiful image of the aspiring power of the spirit in opposition to the downward tendency of an earthly mind.

Totally shut up from the outer world, this peculiar architecture displays an admirable greatness. On approaching the entrance, often hidden, often visible but bare, the uninitiated will not fancy what a splendour will be disclosed in the interior of these rocks. Thus awakes in the mind of the natural man, hidden from the outer world, the first motion of the spirit; it opens in his soul a new, higher, intellectual world as much as the rock of the earthly mind is broken. Not till this new architecture has got her accomplished form, she reappears in the outer world; first, I might say, with a certain coyness, but afterwards in a very decided character.

First, we find an indication of the inner system in light outlines on the even hewn surface of the rock at its entrance; afterwards, the more outlines are replaced by projecting *capitula*, corresponding with the interior architecture, till at last the interior structure, by removing the surrounding masses of the rock, presents itself in its most important part, totally as an open building.

But by this step rock architecture deviates from her peculiar character, and advances irrevocably to her decay. But she has bred the germ of a new shape of architectural forms: she has brought to light the *pillar*, which becomes the principle of a new system, column architecture.

While in the excavated temple the massy pillar performed the mean duty of a bearer, it now becomes, in the nobler form of the well-proportioned column, the ruling character of the architecture of antiquity. Stone columns of more slender proportions, erected in a harmonious order, support the covering structure of beams and plinths, or plates of the same material; surrounded by walls, the whole

yet totally shews the character of the former rock architecture in its interior, though its proportions are much nobler and lighter, while the exterior, by the convergence of the walls, though nobler by approaching the vertical line, bears yet a slight resemblance to the primitive form of architecture.

One people alone was able to ennoble these forms to the highest point, to give them that perfection of which the expression of earthly beauty is in any way capable. While other people, in forming the proportions of column architecture, indulge in the most unprincipled extravagance, we see in Greek architecture how the fine taste of this people has traced the bounds which none can safely transgress.

Now a new extraneous element, the semi-circular arch, enters the decaying system, serving the worn forms as a strong support. Of obscure origin, and in her first youth only employed in the meanest services, this form appears even here in the shape of a servant. Resting on its own piers, which give the necessary addition of strength to the weak columns, the strong back of the arch itself bears the entablature, crowning a structure incapable of supporting itself by its numerous columns.

All the systems of architecture we have hitherto considered belong to paganism. They all have a common characteristic, that of being equally productions of a mind who studies to give sublimity or beauty to architectural forms merely by their impression on the senses alone. This characteristic is particularly evident, when we observe, that in all these systems the ceiling is horizontal, or where this simple construction will not be sufficient to cover a room of some extent, it is superseded by leaving an opening. It must be owned, already in very ancient rock temples, treasure houses, doors, &c., we find forms of the covering parts which very conspicuously approach the form of vaults, and in this manner prestage a much later phase of architecture; yet in this work of so remote an antiquity, our interest is excited only by the appearance of the form, laboriously produced either by taking away a part of the solid mass, or by horizontally projecting layers of stone. But there is nothing but the form, not the higher principle, originating in an inherent necessity, not the idea which elevates the vault to a peculiar organized system of architecture.

MANUFACTURE OF PLATE GLASS.

In promotion of a plate glass company, recently established, Mr. Howard has published some additional details as to the manufacture of plate glass in 1819 and 1847, shewing the reduction in price, and the increase in the quantity sold produced by taking off the duty.

In 1819, when the rate of excise duty was 98s. per cwt., and average selling price per foot 20s., to 25s., the number of feet sold per week was about 3,000; in 1827, duty 60s. per cwt., price 10s. to 12s., the quantity was 5,000 feet; in 1836, duty 60s. per cwt., price 8s. to 9s., the quantity was 7,000; in 1845, duty 63s. per cwt., price about 6s., quantity 23,000 feet; and in 1847, duty-free, price is about 5s., and the quantity 70,000 feet.

The number of hands employed in 1836 was estimated at 2,500; it is now 12,000.

The continental manufacture of this article is chiefly carried on in France, Belgium, Bohemia, Bavaria, Prussia, and Russia. That of France ranks next the best English make, both in colour and brilliancy; but the productions of Belgium are not in any respect equal to the French; and the Prussian also is much inferior to the latter in both these points, as is also the Russian, which is of a very dark colour, and of a more imperfect character generally than any of the others. The Bohemian and Bavarian is blown glass, which, from the nature of the process it undergoes, cannot be rendered so perfect as that which is cast. It is also limited in size and very thin, and is, therefore, unsuited to the general purposes for which plate glass is chiefly used in this country, as well as elsewhere.

For some years the English plate glass has been considered the best manufacture of the kind in Europe, both in colour and brilliancy, and it can be rendered much superior in finish to any now made. The entire remission of the

excise duty, which is no longer permitted to fetter native industry with obstructive restrictions, will now enable the British manufacturer successfully to compete with the foreigner, even in his own market.

It will be seen that, while from 1827 to 1847 the reduction in price was from 12s. to 5s. per foot, or about 60 per cent., the increase in consumption has been from 5,000 to 70,000 per week, or 1,400 per cent.! This fact ought to speak trumpet-tongued to many besides plate-glass manufacturers.

THE CONSTRUCTION AND PRINCIPLES OF TIMBER BRIDGES.

The knowledge of the principles of pontine architecture, and the various methods of construction applicable in bridges of stone, iron, and timber, has perhaps at no period been so frequently called into exercise, as during the time of our immediate recollection. Always important amongst the public works of nations, bridges have, since the invention of railways, been the occasion of an amount of skill in design and labour in construction, with which no previous epoch can be assimilated. Great as may have been the difficulties of construction in many remarkable works in mountainous districts, and where the fury of sudden floods, such as are hardly known in England, has to be anticipated, it is, perhaps within late years only, that bridges have had to be constructed, with so little means of escaping from difficulties which it should be the object of the architect never needlessly to encounter. It is desirable, in commencing any bridge, to select carefully the point for crossing, where the stream is least liable to swell with sudden floods or tides; to cross at right angles; to allow no other consideration except stability and freedom for the streamway and navigation, to interfere with the number and size of the piers and the form of the arches. These have till lately, been generally matters for consideration; but in railway bridges, the position, direction, level, and almost every other similar adjunct, are requirements which allow no opportunity for choice; and the consequent frequent employment of iron bridges has induced many remarkable inventions in that species of construction.

But it is not only in the materials of stone and iron that the construction of railways has led to important improvements in bridge building. Some of the most ingenious works on several lines are their timber bridges. Long viaducts are constructed of timber, where at the commencement of railway construction they were usually of stone, and the material is now so well framed and protected from the influence of the weather, that its durability does not suffer so much as might be expected, from a comparison with stone, whilst in cheapness, it has, when a considerable number of bridges have to be executed, of course very important advantages. It is found more advantageous to make such repairs as a timber bridge may occasionally require, and gain the interest of money, than to expend a large sum upon a stone bridge, which may last many years with but little attention. In America, where timber is plentiful, such considerations have more importance than in England, and many new principles of construction have been employed there with great boldness and skill. One modification of a familiar principle of framing, which we believe has not hitherto been seen in this country, forms the subject of our illustration, for which the drawings were procured expressly for this journal. The bridge, of which the elevation shews one span, crosses the river Richelieu, a branch of the St. Lawrence, at Chambly, near Montreal, in Canada, and was erected at the expense of Mr. John Yule, of that place, to whom we are indebted for the particulars subjoined. But before describing the construction of this bridge, it may be useful if we give some general particulars of the history and principles of timber-bridge building.

In bridges of timber, besides the variation which may be made in the arch, or framing supporting the roadway, there are two important distinctions in construction. Either the piers may be made of stone, as they are in the example we have engraved, or of timber-framing, as in Battersea-bridge, and in several others over the Thames. These bridges are,